

ART. VIII.—*Case of Mollities Ossium.* By JOHN NEILL, M.D., Associate Professor of Clinical Surgery in the Hospital of the University of Pennsylvania.

So few instances of this disease have occurred in this country that I think it a duty to place upon record the following case, and at the same time to notice a few others which have been recorded elsewhere.

Mr. B., a merchant of Philadelphia, was born in Virginia, of healthy parents, one of whom died from yellow fever, and the other from ———. He was a tall, spare-built man, and although not robust, never had any disease of sufficient consequence to confine him to the house, except an attack of pneumonia of the right lung, six or eight years previously to his last illness, from which he recovered without any remaining complications. His habits were active and regular.

In the summer of 1869, he was seized with a pain in his right thigh, which was supposed to be rheumatism; and although there was very decided swelling of the ankle-joint, it did not confine him to the house, until December, when he suffered so much, that he went out but occasionally; after February, 1870, he was confined to his bed. He suffered from severe, deep-seated pain in the middle of the thigh, and the swelling of the ankle continued. He became thinner and weaker, although his appetite was not merely good, but voracious. His food seemed not to inconvenience his digestive apparatus, although but little of it was appropriated. He suffered to some extent from retention of urine, and about the last of July his suffering became very severe, and his attention was suddenly attracted to a prominence upon his thigh, which had occurred in the night.

At this period he came under my care, and I obtained this previous history from others, and not from my own observations. Upon examination of the limb, the deformity was so striking and marked, that it could not well be mistaken; the thigh was bent in the middle, almost to a right angle; the skin was very hot to the touch, and of a dusky-red appearance. Through the integuments and muscles, the bone could be felt, and there was evidently an increase of diameter at the bent portion. The foot, ankle, and lower half of the leg were œdematous, and he referred much of his pain to the ankle. The other limb was extremely emaciated, and indeed his whole body resembled that of a person in advanced and prolonged phthisis. His appetite was still good, in fact, craving; he had great zest in eating and drinking, but his digestion was impaired, and his food, instead of nourishing him, seemed only to act as an irritant to his bowels. Diarrhœa became profuse even when his diet was most carefully regulated, and medicine had very little control over it. His discharges were not only frequent, but of a most unusually offensive character.

The treatment, which consisted of nourishment, opiates, and tonics, had little or no effect, and he died September 26, 1870.

The *post-mortem examination* was permitted, on a promise of restricting the inspection to the diseased limb only. Upon removing the soft parts, which were there expanded, the periosteum over the diseased portions was thickened and of a deeper colour. The bone was one and three-quarters of an inch thick at the bend, and this thickness gradually diminished up and down the shaft towards the epiphyses. In the handling

to which the limb was subjected, there was no flexibility. With an ordinary large scalpel, making firm pressure, I made two semi-elliptical incisions, approaching each other through the bone, longitudinally, and deep enough to reach the medullary canal; the knife went through easily, yet the tissue had some firmness, especially under the periosteum.

Upon an examination of this section, the solid, dense, laminated structure of the shaft of the bone was entirely gone, and in its place had been elaborated a cancellated spongy structure containing oil and bloody serum. The thin edge of this section was flexible, tough, and elastic. After the piece had been washed, the walls were observed to be thinner as they approached the medullary canal, and they were semi-transparent, of a yellowish-brown colour, cartilaginous, but tougher and harder to the touch than the cut extremity of a femur which had been softened in muriatic acid for the purpose of exhibiting the animal matter of bone.

The medullary canal was filled with the same material as the cancelli, a thick, dark coloured, reddish, semi-fluid pulp.

We have been able to discover but two cases of this disease which had occurred in this country, and we present an analysis of the striking features of them.

Dr. Tenny, of Webster, Mass., records in the No. of this Journal for October, 1839, p. 506, a case of a woman 43 years of age, and the mother of five children, who died after two years' illness. At first she manifested general weakness especially in her lower limbs, producing an alteration in her gait. The slightest impediment threw her down; her appetite continued good, and her stomach retained and digested food; she became unable to support her weight, and was confined to bed when her thigh-bone was found flexed at a right angle near the centre. The patient was not sensible of it until it was accidentally discovered, and supposed to be broken; but the extreme emaciation showed that the limb was bent spontaneously, and that the bones were in the same condition.

Autopsy.—Edema of the lower extremities; upon cutting down upon the bone it was found to have been doubled over on itself in such a manner that without altering the general direction of the limb, it had shortened it about two inches, besides which there was a rectangular deformity. The bone was so soft as to be easily pierced by a scalpel. The medulla was disorganized, and the cavity appeared to be filled by a clot of blood. Immediately beneath the periosteum the bone was firmer than elsewhere, though it could be crushed between the fingers.

Dr. Jones, of New Orleans, records (*Trans. Am. Med. Assoc.*, vol. xx. 1869) a case of a young woman eighteen years of age, of humble life, being in great poverty, and supported by alms in a hovel. The father and mother were unhealthy, pale, and cadaverous, and for a long time had been the victims of malaria. The softening of the bones commenced in the leg after an attack of ague. The left humerus lost all its earthy matter for the space of five inches, and she suffered great pain; the upper and lower end seemed to be bony, but the intervening part had been converted into a flexible cartilaginous mass; the arm could be bent at right angles; the right humerus was rough and enlarged, and painful to the touch, and the right radius was apparently destroyed; the left tibia and fibula were divided or absorbed; and her mother states that this leg "was fractured at night with an audible snap." Although eighteen years of age, she was only three feet nine inches high, and weighed not more than a child four years of age.

It is believed that these are the only cases recorded as such in American journals, and in addition we give a condensed account of several others, which have been reported very fully in Dr. Jones's excellent paper.

Mr. Sylvanus Bevan, F.R.S. (*Philos. Trans.*, vol. xlii. No. 470), states that a woman in 1738 was seized with diabetes, and after eighteen months of fever and wasting and pain, was obliged to go to bed. The bones in her arms and legs became soft to the touch, and could be bent in a curve, and finally became as limber as a rag.

Post-mortem examination.—The outer laminae of the bones were soft and membranous, containing, instead of a bony substance, a thick fluid of reddish colour. There was no appearance of bones in her legs and arms except near the joints, but what remained was soft and full of holes like a honey-comb. Those parts of the bones that were most compact and hard were dissolved first, whilst their heads, which were more spongy and soft, had not so entirely lost their substance.

Ambrose Hosty, M.D., reports (*Philos. Trans.*, vol. xlviii.) the case of Ann Elizabeth Queriot in 1753. She was 35 years of age, married, and confined three times. After her last labour she was seized with pain in her limbs, and became bed-ridden and distorted; all the bones were affected. The lower extremities turned upward, and became parallel with her body. This state was attended with exquisite pain.

Post-mortem.—Upon cutting in the left tibia some parts were entirely dissolved, and the sides were not thicker than the gristle of the ear. Instead of the marrow, a thick red matter like coagulated blood mixed with grease was found in all the bones.

John Pringle, M.D., F.R.S., reports the case (*Philos. Trans.*, 1753, vol. xlviii.) of Mary Hayes, who heard her bone snap while walking, after which the bones of the legs and thighs grew flexible. Her spine became distorted; she was confined to her bed, wasted and died, and her body was two feet shorter than when living.

Post-mortem examination.—All the bones were more or less affected, and scarcely any would resist the knife. They were so soft that they were cut through without using the edge of the knife. Those bones were most dissolved which were in the natural state most compact, and contained most marrow in their cavities, and the heads of them were the last portions dissolved. The interior was filled with a dark, pulpy, parenchymatous substance like soft dark-coloured liver.

Thomas K. Chambers, M.D., reports (*Lancet*, March 25, 1854) the case of a young woman who had a spontaneous fracture, first of one thigh and then of the other, in St. George's Hospital. She suffered great pain in both arms, which became paralyzed. The pelvis and ribs fell in, and she died in a year. The bones throughout the system were found soft and unresisting; a sharp knife could readily pass through them. A section of the tibia was of the colour of muscle, its shape being retained by the periosteum. "The microscope exhibited the bone as consisting of large fat vesicles, some containing a white and some a reddish oil. The parts next the periosteum, which felt gritty, presented, when examined under a quarter-inch object-glass, some islands of opaque bone, the bone corpuscles being indistinct and the canaliculi not to be discovered.

Mr. S. Solly reports two cases, the first (*Med.-Chir. Trans.*, vol. xxvii.) being that of a young woman whose health began to decline at nineteen, and whose bones fractured easily, and whose spine became distorted. She suffered great pain. Her head became enlarged, and her mind became affected. She was unable to stand, and had to push herself from place to place. She became much emaciated, and suffered excruciating pains in her bones. Her appetite was good. She was twenty-nine when she died.

Post-mortem examination.—A longitudinal section of the long bones showed that the osseous structure of the bone was nearly absorbed, a mere shell being left. The interior was filled with a dark grumous matter, varying in colour from that of dark blood to light-reddish liver-colour. The Haversian canals were enormously dilated, and the osseous corpuscles diminished in quantity. The joints were all healthy.

The second case (*Med.-Chir. Review*, April, 1845) was Sarah Newbury, 39 years of age; married for nine years, no children. Was robust until she had an attack of rheumatism, when she fell, and was subsequently confined to her room.

She suffered great pain in her bones, and was hardly able to walk. When her husband was carrying her, her thighs were suddenly drawn up. The spine became curved, the clavicles, which had been previously fractured, were now bent. Both thighs were broken, the left twisted inward and the right bent at an acute angle in the centre. Subsequently the right foot was completely drawn over her head, in the same position as is represented in the case of Madame Supiot, *née* Quenot. She died after eight years' sickness.

The *post-mortem* was very carefully performed, and numerous sections were made of all the bones which were generally diseased. But that of the right thigh was the most characteristic. The whole of the osseous matter had been removed, and in the centre nothing but periosteum and membranous matter left. Towards the condyles the bone was nearly of its natural colour. In the lower third the red matter was abundant, exhibiting various hues. The red matter was carefully examined by Mr. Birkett of Guy's, and Mr. Ruiney of St. Thomas's Hospital, as well as by Mr. Simon of King's College.

The reader might here say that the reproducing of these cases, with some of their striking peculiarities, only shows their similarity to the case which is the occasion of this paper, and confirms the statement that the disease is not of frequent occurrence, and that but few instances are recorded.

But, upon a closer investigation of the first case, together with those condensed accounts which follow it, it will be seen that the disease has some common positive characters, and these may be stated in a general way in a few words.

Mollities ossium or osteo-malacia occurs in adult life, in persons previously healthy. It attacks the dense portions of the bone, before the spongy parts. It is attended by severe pain, which is often excruciating. Deformity suddenly occurs, of an angular character, by partial fracture or bending; and this deformity is never permanently removed. The general health fails; and though the appetite may continue, there is wasting and emaciation. No recoveries have taken place; death is certain. The *post-mortem* appearances show swelling of the bone and thickening of the periosteum. The middle part of the shaft, which is hard and laminated, is changed into spongy cancellated structure, which can be cut with a knife. The earthy matters of the bone are absorbed and the cells are filled with a semifluid, red, and oily substance. The bones become flexible in proportion to the degree of absorption of the earthy matter.

Although the account given above we believe to be a true and accurate description of the disease, we are bound, in view of the present literature of the subject, to present another side of the picture, and to state that not only very different but very opposite views are held as to the nature of mollities ossium, and that some of the distinguished modern writers upon pathology not only attach no faith to such an account as we have given, but equally discredit each other's views.

For instance, Rokitansky says :—

"It occurs chiefly in the bones of the trunk, and when the bones of the extremities are affected, they are so always in a subordinate degree. The deformities which result from mollities ossium are restricted to the trunk. The bones diminish in size."

Still more opposed to our views are Mr. Paget's statements, who, after examining numerous specimens in the Hunterian Museum, considers the disease essentially "fatty degeneration." He says:—

"Nothing can better express the character of the change than its similarity to fatty degeneration of other organs, in which we find the proper substances of the part gradually changed for fat, and the whole tissue spoiled, while the size and outer form of the part remain unaltered." And again, "These investigations were made in a collection containing specimens from nearly all the cases, with whose histories we are most familiar." In the second edition of Mr. Paget's valuable work, reference is made to three other cases subsequently reported, which confirm his view of fatty degeneration, and he says: "I have never seen a specimen *which appeared to fulfil in any degree the general notion of mollities ossium as a disease, consisting in the removal of the earthy matter of the bone, and the reduction of any part of the skeleton to its cartilaginous base.*" And again, after opposing Rokitsansky's generalization, that it occurs more frequently in *females*, and in the bones of the trunk, and that the bones are flexible and not brittle, he concluded by the following remarks: "I think we may consider that there are two diseases included under the name of mollities ossium, namely, fatty degeneration, which these specimens show, and which seems to be more frequent in England; and the simple softening of bone, or rickets of the adult, to which Rokitsansky's description alludes, and in which the bones are flexible rather than brittle, and appear reduced to a cartilaginous state." After reading such statements from such authorities, it is not surprising that Mr. Holmes, in the last edition of his valuable *System of Surgery*, should say, "the pathology of mollities is far from being satisfactorily established; and there can be little doubt that this has arisen, in a great part at any rate, from the fact that authors have confounded several different conditions under the same name. Some indeed make no distinction between mollities and fragilitas ossium, while others regard mollities as an affection allied to, if not identical with, rickets."

It would occupy more space than was intended, in giving the history of a case with a few remarks, if a contrast were now instituted between rickets and fragilitas ossium, and mollities, but it is proper to notice in passing, that rickets is a disease of childhood, occurring in those of originally defective and deficient health; that it is attended with but little pain, and that recovery is the rule. There is a deficiency of supply of the earthy material, and the bones, as they grow, become flexible, and are bent by the weight of the body as well as by muscular contraction. The bones of the lower extremities are bent, the spine twisted, and the pelvic arch falls in, and when adult life is attained, and ossification is completed, the results are bandy legs, sigmoid spine, and contracted pelvis.¹

And, it might be said of fragilitas, that it is a mere symptom or result, and not truly a disease; that brittleness is a condition, dependent upon age, fatty degeneration, thinning of walls, cancer, atrophy, etc. But if we limit its meaning as is usually the case to that state which accompanies a tendency to frequency of fracture, which has been met with by almost every surgeon, and which was always supposed to be dependent upon a want of proper proportion between the animal and earthy matters of the bone, and of which so many cases are recorded in the text-books and

¹ See Dr. Parry's papers, Amer. Journ. Med. Sci., Jan. and April, 1872.

journals, it can be readily seen that neither rickets nor fragilitas correspond to the views which have been expressed upon mollities ossium. And in many of the text-books of the day, even in Mr. Erichsen's *Surgery*, mollities and fragilitas are described under one head, and Mr. Tyrrell's case, in which twenty-two fractures occurred, and also Mr. Arnott's case, in which there were thirty-one, are quoted in exemplification of the subject. Nor should these remarks be terminated without an allusion, at least, to some of the recent articles which have appeared in the journals bearing upon this subject.

Mr. Pedlar, L.R.P.C., has presented a very interesting paper (*West Riding Lunatic Asylum Reports*, vol. i. 1871), entitled "*Mollities Ossium and allied Diseases*," in which numerous cases are reported illustrative of the subject of "breaking of ribs in asylums," in which very remarkable statistics are brought forth, but we hardly think that the disease corresponds in its essentials to mollities. Dr. Geo. Warder, superintendent of the county asylum at Carmarthen, states (*Lond. Journ. Mental Science*, Jan. 1871) that of twenty bodies of patients dying in 1870, nine were found with bones in an "abnormal and diseased state." The manifestations of the disease were mostly in the ribs and sternum, and the bones were soft and easily broken down.

Dr. Ormerod's description of cases (Dr. Barnes's paper, *Obst. Trans.*, vol. xiii. 1871; also *Amer. Journ. Med. Sci.*, July 1872) leads us to suppose that he described some other disease than mollities.

And Dr. Casati, of the Royal School of Midwifery at Milan, records during a period of eight years "7719 deliveries, of whom sixty-two presented evidence of clearly marked osteo-malacia." Almost all of the cases came from one valley in which the people lived in damp houses, and were overworked and badly fed; forty-one of these cases had "deformed pelvis."

The most complete and perhaps the most instructive paper recently published on this subject is by Mr. Arthur E. Durham, *Guy's Hospital Reports*, 1864, 3d series, vol. x. He details three cases, the first of which presented in a marked way the characteristic symptoms of the disease.

Previously healthy woman, æt. 45, the mother of four healthy children. After her last confinement was seized with pain in her lower extremities, which became œdematous. The pain became so severe that she fainted in attempting to dress herself, and falling from the edge of the bed broke her right thigh and was sent to St. Bartholomew's Hospital, where she remained five months. No reparative action took place, and about a month afterwards, whilst her bedclothes were being changed by the nurse, the left femur gave way; she did not feel it crack, it seemed merely to bend. Deep-seated and aching pain attacked the other bones, one after another giving way, in each instance bending rather than breaking. She became much emaciated and deformed, and her sufferings were very acute. Her appetite was tolerably good. After a short time her decline became rapid, and she resembled a person in the last stage of hectic fever. At the *post-mortem* it was discovered that all the bones had undergone those changes which are characteristic of true mollities ossium.

They could without exception be cut by the knife, and for the most part with great ease. The shafts of long bones were affected to the greatest extent; and seemed to consist of a soft, greasy mass, not unlike liver in appearance, but more gelatinous in consistence, inclosed in a thickened and altered periosteum. The pelvis was not notably distorted, though its bones were softened.

Besides reporting these cases, Mr. Durham collects many others, and is able to add 14 to "Litzmann's 136, whose treatise on the subject is the most complete yet published with the exception perhaps of Beylard's."

Out of 145 patients, 13 only were males and 132 females; of the females, 91 were first affected during pregnancy or very shortly after childbirth.

There were only 10 cases affected under 20 years of age. The great majority began to suffer when between 25 and 33 years of age. In a majority of the cases not immediately connected with pregnancy or childbirth the symptoms first manifested themselves in the lower extremities. In a vast majority of the 91 cases described as commencing in connection with pregnancy, the first symptoms manifested themselves in or about the pelvis and lower part of the spine. In 73 of the cases the disease was absolutely confined to the bones of the trunk, and in a very great many cases there is no evidence of any other than the pelvic bones having been affected.

Mr. Durham raises the question as to how many of these last cases are to be regarded as examples of true mollities. And we certainly are disposed to agree with him that many of the cases which have been alluded to in the previous part of this paper as presenting obstetric difficulties should rather be considered as cases of deformed pelvis originating perhaps in some other disease. His views as to the relations of mollities to rickets and fragilitas are also decided. "Mollities ought never to have been confounded, as it has been and still appears to be in the minds of some, with rickets on the one hand, and senile fragility of the bones on the other. In rickets the primary cartilages have never become properly ossified. In senile fragility the animal matter of the bones appears to be absorbed as rapidly, if not more rapidly, than the earthy constituents, and none of the characteristic general symptoms of true mollities are present."

Without even alluding to other papers, such as Mr. Dalrymple's, in the *Dublin Journal*, vol. ii., in which microscopical and chemical investigations are detailed, we will conclude these remarks with a *resumé* from Rindfleisch, which freely confirms the views that have been expressed as to the nature of mollities.

He considers that its principal and almost only anatomical sign consists in an abstraction of lime and gradual liquefaction of the solid osseous tissue. If we break off one of the smallest of the osseous trabeculae from the cancellated structure and treat it with carmine and then examine it microscopically, it will have the appearance presented in Fig. 182 (Rindfleisch, *Pathological Anatomy*). This osseous trabecula consists of two kinds of substances; an exterior one lying next to the medullary spaces, and to the Haversian canals; and an inner

one which follows the axis of the osseous trabecula. The inner one contains a perfectly normal osseous tissue; the bone corpuscles with their numberless anastomosing processes, and the strangely refractive thoroughly colourless basis-substance, are intact. The outer one, on the other hand, shows us a minutely striated basis-substance, coloured deep by the carmine, which only here and there exhibits small shaded lines as the last remains of formerly existing bone-corpuscles. The change which we here see before us, reminds us too much of the known change which osseous tissue undergoes in removing the lime by means of hydrochloric acid, that we could for one moment doubt that here also a decalcification of the osseous tissue (halisteresis, Frey) had taken place. This decalcification progresses upon every osseous trabecula from without inwards; we may observe its progress at the time upon the sharp line which separates the decalcified osseous tissue from the normal. Herewith it is interesting to see that this line does not run parallel to the outer contour of the osseous trabecula, but in just such indented curves, such as we otherwise only perceive upon the line of resorption of the osseous tissue in inflammations, caries, etc. He advances the opinion that an acid, proceeding from the medullary spaces and the Haversian canals, robs the bone-tissue of its salts of lime. The decalcification is the first act of the bone softening. Some time afterward follows the second act, the dissolution of the decalcified bone-tissue. This also advances from the medullary spaces towards the axis of the osseous trabeculae. The latter for some time consist only of bone-cartilage, then they become more and more thin at the centre, finally melt down and disappear from view.

ART. IX.—*Cases Illustrating the Application of Elastic Ligatures in Surgery.* BY STUART ELDRIDGE, M.D., in charge of Imperial School of Medicine, Hakodate, Japan. (With a wood-cut.)

IN 1871 Mr. Henry Lee, of London, suggested that bands or cords of India-rubber might be advantageously substituted for the ordinary ligature in the strangulation of small tumours, and, more recently, Prof. Dittel, of Vienna, has independently arrived at the same conclusion while much extending the application of the idea. Prof. Dittel has operated, as our readers well know, by the rubber ligature for the removal of the testis and mamma, and has even amputated the thigh in this way, a proceeding in which he will probably be but seldom imitated.

During the year just past I have made much use of the elastic ligature for the removal of tumours, and in other cases in which gradual severance by ulceration was admissible, and with most gratifying results. I give below a few illustrative cases, premising that I have several times used the ligature in cases in which I should have preferred the knife, but in which the patients absolutely declined the more rapid operation.

1. *Vascular tumour of scalp.*—Kana Toshi, child, aged eight months. An angioma had existed upon the upper portion of the forehead since birth, and had rapidly enlarged, until, at the time I first saw the case, the tumour was larger than the half of a hen's egg, and of much the same shape; the skin very thin and vascular, not only over the tumour, but for